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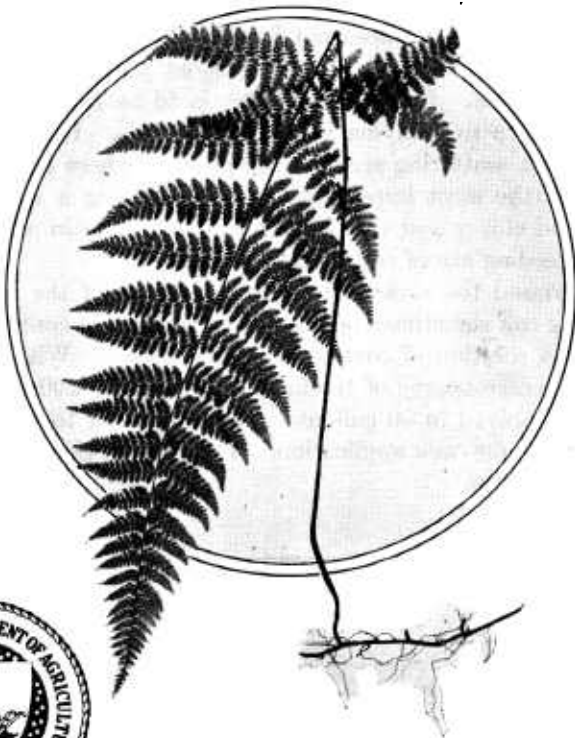
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ERADICATION OF
FERNS

FROM PASTURE LANDS
IN THE EASTERN
UNITED STATES



HAY-SCENTED FERN and bracken are troublesome weeds in the hill country of the Northeastern States and in the higher mountain country of the States farther south. On the Pacific coast western bracken is the principal weed fern, and the treatment advocated in this bulletin would probably not be effective.

In most parts of the East where the ferns are weeds the land is so steep and rocky that cultivation is not practicable. It has been found that cutting off the tops close to the soil surface twice a year for 2 years will kill nearly all the ferns. The best times to do the cutting are just previous to spore formation or about the middle of June, and the middle of August in southern New York.

Cutting is ordinarily somewhat cheaper than spraying; furthermore, cutting does not interfere with the growth of young clover and grass on the infested patches after the first treatment. Cutting, therefore, is to be recommended in preference to spraying in most situations. It has been found that scattering seed on the patches where ferns had grown is the most important means of getting a stand of grass and clover and that liming and fertilizing in addition to the seeding are of considerable benefit.

On ground too rocky for the effective use of the scythe spraying can sometimes be done to advantage in controlling ferns. A solution of common salt is effective. With ferns at an average degree of thickness on the land, 200 pounds of salt dissolved in 80 gallons or more of water to the acre is sufficient for each application. Two sprayings a year are usually sufficient.

ERADICATION OF FERNS FROM PASTURE LANDS IN THE EASTERN UNITED STATES

By H. R. Cox, formerly *agriculturist, Office of Farm Management, Bureau of Plant Industry*¹

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WEED FERNS AND AREAS INFESTED

THERE ARE nearly 7,500 recognized species of ferns in the world, of which number over 200 are known to be native to the United States. A few species have become weed pests in this country.

The parts of the United States in which ferns are bad weeds are, principally, (1) the hill country of the Northeastern States and the highest portions of the Appalachian Mountain region as far south as Georgia, and (2) the Pacific coast country west of the Cascade Mountains. In the former region, which is the area covered by this bulletin, the principal weed ferns are hay-scented fern (*Dennstaedtia punctilobula*) and bracken (*Pteridium latiusculum*, formerly known as *Pteridium aquilinum* and *Pteris aquilina*). Both kinds are sometimes called brakes. In the Pacific coast section the most common weed fern is western bracken (*Pteridium aquilinum pubescens*), a plant closely related to the bracken of the East.

Several other species in the eastern region are sometimes annoying, but they occur largely in low and moist places and do not give much trouble on good pasture land. They are principally the cinnamon fern (*Osmunda cinnamomea*), the marshfern (*Dryopteris thelypteris*), and the sensitive fern (*Onoclea sensibilis*).

SCOPE OF THIS BULLETIN

This publication deals only with fern eradication in the Eastern States, and it should be understood that the fern referred to in the following pages is the hay-scented fern and bracken of the East.

Western bracken is even more serious as a pest on the Pacific coast than are any of the fern species in the East. Owing to the nature of the land and the kind of farming in vogue on the Pacific coast, there

¹ Revised by L. W. Kephart, senior agronomist, Division of Cereal Crops and Diseases.

are several methods that can probably be used to advantage in that region that cannot be employed in the East.

HABITS OF GROWTH

HAY-SCENTED FERN

The hay-scented fern (fig. 1) has a perennial, very slender rootstock one-eighth to three-sixteenths of an inch in diameter, extensively creeping below ground parallel to the surface. From the rootstocks arise at short intervals the fronds, or leaves, of the plant. These fronds are 1 to 3 feet high and 5 to 9 inches wide when mature. The fruit dots occurring on the margin of the leaf bear the spores which are comparable to the seeds of seed-bearing plants.



FIGURE 1.—Hay-scented fern.

This kind of fern grows in patches or clumps (fig. 2), the surfaces of which are raised above the rest of the land and are soft and spongy, consisting of an accumulation of dead fern and forest leaves. Young grass is unable to work its way into these dense clumps.

The hay-scented fern is rather particular as to location. It thrives in places partially protected from the sun's rays, such as northern, eastern, and western slopes, or in areas close to stone walls or trees. It is noteworthy that this fern is not found in places that are much trodden.

BRACKEN

Bracken (fig. 3) has underground parts similar to those of hay-scented fern, but the rootstocks are stouter and more woody and creep longer distances below the soil surface. Bracken also has the same methods of reproduction as hay-scented fern. Eastern bracken is usually 1 to 3 feet high. Western bracken attains a height of 6 to 8 feet. The leaf blades are triangular and umbrellalike, 1 to 4 feet broad, and long and more or less three-parted, the larger branches usually twice-divided. At maturity the fruiting leaves have a continuous edging of spore cases, which shed the light-brown spores in great quantities.

In the Eastern States bracken is distributed somewhat more generally than hay-scented fern, not being confined so exclusively to the hill and mountain country. From its habit of being widely creeping, bracken does not occur in dense well-defined patches, like the hay-scented fern.

METHODS OF ERADICATION

As the grazing of livestock is a prominent feature in the farming of the eastern region in which ferns are weeds and as the area of available pasturage has been curtailed by the presence of the ferns,

these weeds are looked upon as a serious pest. Moreover, since these lands for the most part are so steep and rocky as to prohibit cultivation and since ferns, unlike many other pasture weeds, cannot be reduced in number by increasing the vigor and thickening the stand of the pasture grasses, a real problem in weed control is presented.

The methods that have been adopted for eradicating ferns are



FIGURE 2.—A pasture in southern New York with a characteristic growth of hay-scented fern.

cutting or mowing, burning, salting livestock, cultivation, and spraying.

CUTTING OR MOWING

In 1557 Thomas Tusser wrote his *Five Hundred Pointes of Good Husbandrie*, in which he said:

In June and in August, as well doth appeere,
Is best to mowe Brakes of all times of the Yerre.

Experience has shown that this old precept still holds good and that mowing twice a year is still a good practice.

It is best to make the cuttings just previous to the time when the ferns mature their spores (fig. 4). This not only prevents propagation by means of spores but greatly weakens the rootstocks, which are at their most susceptible stage just previous to sporing. Where the spores mature during the latter part of June, the proper time to make the first cutting is about the middle of that month. New leaves spring up immediately, so that one more cutting must be made that season to prevent sporing. This second cutting should be made about the middle of August. It is highly important to observe the precaution that if either of the cuttings is put off until after the spores

mature, the plants should not be disturbed during the remainder of that season, since mowing the ferns after the spores ripen seems to scatter the spores a great deal more than leaving the plants undisturbed.

Cutting must usually be done by hand (fig. 5), as the land is usually too rough to admit of the use of a mower. In a pasture with an average quantity of fern, one man with a scythe can cover about $2\frac{1}{2}$ acres in a day. The leafstalks are tender and are easily cut with a scythe.



FIGURE 3.—Bracken.

The writer has found a number of farmers in the mountain-pasture district of North Carolina who have successfully used this method of eradicating ferns. The plan seems to be generally accepted as the best in that region.

Cutting ordinarily is a cheaper method of handling ferns than spraying. With ferns in an average degree of thickness in a pasture a man ought to cover about $2\frac{1}{2}$ acres a day. With labor at \$3 a day the cost of cutting fern is about \$1.20 an acre each cutting, as compared with spraying with salt, which costs about \$2.50, or spraying with sodium chlorate, which costs about \$6. A further advantage of cutting is that it is less complicated than spraying and requires only the use of a tool with which all farmers are thoroughly familiar.

Still another advantage is that seeding to grass and clover can be made as soon after the first cutting as is desired. After the original stand of ferns is cut down, the subsequent growth is seldom so thick as to prevent young grass working in. The seeding can be done the same year that the work of

eradication is started, so that by the following year a good growth of young grass and clover may be expected, which in itself contributes to the reduction of the number of ferns.

BURNING

Burning the fern patches after cutting serves as a further check to the pest. After the mowed fern leaves have become dry, fire is started on the windward side of the patch. Not all patches will burn completely, as there are varying quantities of combustible material in the areas. Where a fierce fire has passed over a patch the fern rootstocks are injured to a considerable extent, and the subsequent growth of young shoots is usually not as vigorous as when the patches have not been burned. The burning should be done, of course, before grass and clover are sown.

SALTING LIVESTOCK

Where ferns occupy very small areas on a farm certain methods may be used that would not be economical on a thickly infested piece of land. One of these methods is salting livestock in the fern patches. Dry salt is scattered on the plants when they are moist with rain or dew. The stock eat and trample the plants in their effort to get the salt. Since the saltings must be rather frequent, the areas treated should be those that are easily accessible.

CULTIVATION

There is no doubt that cultivation destroys ferns. The difficulty is that the steep and rocky character of the fern-infested land does



FIGURE 4.—General view in southern New York, showing land in the foreground on which hay-scented ferns have been eradicated by cutting.

not permit effective cultivation except on limited areas. Cultivation has been tried with indifferent success. When a piece of pasture was plowed and put into small grain, and then seeded to grass, the fern worked in again, so that it became as thick as formerly. Another piece of pasture land was well cultivated in potatoes and afterward seeded to grass. In this piece the fern was slower in working back, but later a fairly good stand of the weed was found. If the cultivation could have been continued for several years, permanent eradication of the fern might have been expected, but the character of the land prevented this treatment.

SPRAYING

Of the common weed-killing chemicals, salt is the best with which to make a solution to spray ferns (fig. 6). Iron sulphate proved



FIGURE 5.—Cutting ferns with a scythe on a hillside.



FIGURE 6.—Fields in southeastern New York where the experiments in fern eradication were carried on. In the immediate foreground is the plot sprayed with salt solution, which destroyed nearly all the ferns in one season.

ineffective. Arsenite of soda was effective, but its use involves considerable risk, as it is poisonous to man and animals; furthermore, it is rather difficult to obtain except in the larger centers. Sodium chlorate, a chemical widely used of late years for destroying weeds, is more powerful than salt, but its use is attended with considerable risk from fire and some risk of poisoning livestock. It is more than twice as expensive as salt. Salt is very effective, is easily obtainable, and probably exerts an after effect favorable to grass. As salt is also relished by livestock, treating ferns with it in pastures to which stock have access gives added assurance of the ferns being destroyed.

The quantity of salt required per acre depends on the thickness of the ferns. Two hundred pounds to the acre is usually ample. Salt should be used in an almost saturated solution; that is, 1 pound to about $1\frac{1}{2}$ quarts of water.

The cost of spraying varies under different conditions. The difficulty of hauling water up steep slopes is sometimes so great as to make spraying almost prohibitive. After the materials are hauled to the field, the work of spraying proceeds faster than cutting. With ferns of an average degree of thickness, a man with a knapsack sprayer ought to cover about 5 acres a day. Assuming that 200 pounds of salt costing 1 cent a pound is used per acre and that 5 acres are covered in a day with labor worth \$3, the cost of spraying with salt is \$2.60 per acre for each application, not including the cost of hauling the materials. As the first spraying is the most expensive in labor and materials, this treatment may cost a little more than the amount mentioned, while the subsequent treatments will probably cost less.

One disadvantage of spraying is that it is a detriment to the growth of young clover. This means that the measures for encouraging the clover to work into the patches occupied by fern should be deferred until after the last spraying has been made. It is probable that the spray does not injure young grass to any great extent.

An advantage of spraying is that it may be employed in situations that are too stony for the effective use of the scythe (fig. 7). There are also certain other situations where large spraying outfits may be satisfactorily used. Spraying with a barrel pump on a low wagon can sometimes be done more cheaply than with a knapsack outfit.

NUMBER OF TREATMENTS NECESSARY

Two treatments a year, either spraying or cutting, seem to be about as effective as four and are to be recommended. Undoubtedly the best time to treat the ferns is just previous to spring, or about the middle of June and the middle of August.

HOW LONG SHOULD ERADICATION MEASURES BE CONTINUED?

It probably is not practicable to eradicate ferns absolutely. After they have been reduced to a minimum the specific methods of destruction may be discontinued, at least until the weeds again become troublesome. The reduction of the number of ferns will give the grass and clover ample opportunity to work in, and this in itself will tend to hold the ferns in check.

GETTING A STAND OF GRASS ON THE FERN PATCHES

After the ferns have been greatly reduced or entirely eradicated, grass is very slow in working into the patches unless certain measures are adopted. Of these measures, scattering grass and clover seed over the patches is the most important. The stand is better and



FIGURE 7.—View of a pasture from which ferns have been eradicated, except among rocks and close to the stone fence, by cutting. This pasture presents conditions under which spraying with a salt solution may be the best method of eradication.

the growth more vigorous, especially in the case of clover, if lime and fertilizer are applied in addition to the seed.

Seed may be sown in either early spring or late summer. In these tests the seed was applied at the latter period, that is, during August, with excellent results. If the seeding be done at this time the young grass seedlings are injured less, probably because of the shading effect of the ferns than if the seeding were done in early spring.

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